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PENSOFT

Dipsas indica (Laurenti, 1768) (Serpentes, Colubridae, Dipsandinae): additional country record, list of voucher specimens, and discussion on distribution in Bolivia

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Abstract. We present a new country record for *Dipsas indica* (Laurenti, 1768) (Serpentes, Colubridae, Dipsadinae) and discuss the species' distribution in Bolivia and South America. Little information on museum specimens and locality data from Bolivia exists for this species in the scientific literature, which has been largely based on a single museum specimen. This information contributes to the knowledge of its distributional status and summarizes known and available data for Bolivia.

Keywords. Neotropics, Pando, reptile, Squamata, snake

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Introduction

The genus *Dipsas* Laurenti, 1768 is comprised of more than 50 species (Peters 1960; Wallach et al. 2014; Uetz et al. 2022). Species of *Dipsas* are largely arboreal and cochliophagus, considered specialized "snail eaters", which commonly prey on invertebrates (Dun 1951; Peters 1960; Sheehy; Ray et al. 2012; Mebert et al. 2020). Little is known about the habitat use and preference of *Dipsas* species; however, they have been found in areas in or around a variety of habitat types such as open savannahs, wetlands, various forest types and forest successional stages, and they occur broadly in five biome types across South America (Cerrado, Atlantic Forest, Amazonia, Chaco, Llanos) (Sazima 1989; Harvey and Embert 2008; Nogueira et al. 2019).

Specifically in Bolivia, *Dipsas* is represented by nine species: *D. bucephala* (Shaw, 1802), *D. catesbyi* (Sentzen, 1796), *D. chaparensis* Reynolds & Foster, 1992, *D. cisticeps* (Boettger, 1885), *D. indica* Laurenti, 1768, *D. pavonina* Schlegel, 1837, *D. peruana* (Boettger, 1898), *D. turgidus* (Cope, 1868), and *D. variegata* (Duméril, Bibron & Duméril, 1854) (Peters 1960; Peters and Orejas-Miranda 1970; Harvey and Embert 2008; Uetz et al. 2022). In particular, limited knowledge exists on the occurrence of *D. indica* in Bolivia (Harvey and Embert 2008), despite having a wide distribution across a large portion of South America; this knowledge is largely based on a single museum specimen (Peters 1960; Peters and Orejas-Miranda 1970; Harvey 2008; Nogueira et al. 2019). The *D. indica* complex consists of three recognized subspecies, *D. i. indica*, *D. i. ecuadoriensis* Peters, 1960, and *D. i. petersi* Hoge & Romano-Hoge, 1975, that occur in Bolivia and are only separable on the basis of color pattern (Harvey 2008; Uetz et al. 2022).

Here we describe a specimen of *D. indica* recently collected from the department of Pando (Centro de Investigación de Recursos Acuáticos, CIRA-909) and

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discuss the current and known distribution of this species in Bolivia.

Methods

Scale counts, scutellation, and terminology follow Dowling (1951) and Peters (1964). Paired subcaudals were counted on one side only. Head scale counts (i.e., loreal, preocular, postocular, supralabials, infralabials, and temporal) were reported from one side only. Dorsal scale row counts were taken at three standardized locations: head length behind occiput, midbody, and head length anterior to cloaca; these are separated by a slash (/). Measurements were taken using a flexible ruler to the nearest millimeter. Weight of the specimen in grams (g) was determined using an Ohaus model HH 320 electronic balance. Sex was determined via a probe following McDiarmid et al. (2012) and confirmed by injection following Simmons (2002). Specimen identification was determined by comparing and analyzing meristic data, morphometrics, coloration, figures, photographs, and descriptions following taxonomy by Peters (1960) and Harvey and Embert (2008) for *D. indica indica*. The specimen was fixed in a 20% formalin solution and preserved in a 70% ethanol solution. Geographic coordinates in decimal degrees were determined using a Garmin eTrex GPS receiver and using the WGS84 datum. All specimens are associated with specific coordinates, where data permit. The record and distribution map were prepared using ArcGIS Pro v. 2.7 (Environmental Systems Research Institute, Inc., Redlands, CA).

Abbreviations for museum collections are as follows: Colección de Historia Natural de Herpetología, Centro de Investigación de Recursos Acuáticos, Universidad Autónoma del Beni José Ballivián (CIRA), Noel Kempff Mercado Natural History Collection (CNK), University of Michigan Museum of Zoology (UMMZ).

A comprehensive search for voucher specimen information consisted of reviewing published scientific papers, journals, books, and government reports. Online databases (i.e., VertNet, https://vertnet.org; ARCTOS, https://arctosdb.org/; Global Biodiversity Information Facility (GBIF), https://www.gbif.org/; SpeciesLink, https://splink.cria.org.br/) were also searched. In addition, natural history museums were contacted for voucher specimen verification and information. Harvey and Embert (2008) indicated that they discovered numerous specimens that were misidentified as *D. indica* in collections; therefore, we identified which specimens were verifiable.

The most recent specimen was deposited in the herpetology collection of the Centro de Investigación de Recursos Acuáticos (CIRA-909) in Trinidad, Beni, Bolivia. Specimen collection was approved by the Texas A&M University – Kingsville (#2018-05-22) Animal Care and Use Committees and permitted by the Dirección General de Biodiversidad y Áreas Protegidas Bolivia (permit #0120/2022).

Results

Dipsas indica (Laurenti, 1768)

New record. BOLIVIA– **Pando** • Federico Román; 10.5552°S, 066.1524° W; 18.VI.2022; C.B. Eversole, R. Powell, and L.R. Rivas Torrico leg; specimen found ~1.09 km SW of community of Santa Teresa, 0.5 m above ground on tree branch; 1 ♂, CIRA-909 (Fig 1).

Identification. *Dipsas indica* is characterized by having 13/13/11 dorsal scales (unkeeled, with no apical pits), 178–209 ventral scales, 87–122 subcaudal scales, an undivided cloacal scale, 1 loreal scale, 1 or 2 preocular scales, 1 or 2 postocular scales, 9 supralabial scales, 13–16 infralabial scales, 1–2+2–3 temporal scales, and 2 or 3 pairs of chin-shields (see Table 1 for a meristic comparison with Bolivian specimens CIRA-909 and UMMZ 59774; Schmidt and Walker 1943; Peters 1960; Cunha and Nascimento 1978; Harvey and Embert 2008). While Schmidt and Walker (1943) and Cunha and Nascimento (1978) reported a maximum of 209 ventrals and Cunha and Nascimento (1978) reported a maximum of 122 subcaudal scales, the new specimen (CIRA-909) with 210 ventrals and 126 subcaudals is slightly outside the previously reported range for ventral and subcaudal scales. Morphometrics of this specimen (CIRA-909) included a snout to vent length of 46.0 cm, a tail length of 17.8 cm, and a living mass of 12.60 g (Fig. 2, Table 1).

Color and pattern: dorsal head scales are extensively mottled with brown spots edged in cream and labials have dark sutures; the nuchal collar is tan to light gray. The first blotch does not reach the rictus and is separated from parietals by 4–9 vertebrals. The dorsum is grayish-brown, with darker markings narrowly edged first in yellow then in dark brown, usually not blotches. A row of subcircular cream to yellow spots present, dorsal blotches incomplete ventrally and widest at paraventrals, which are longer than interspaces over most of body and usually not forming bands anteriorly. Interspaces are mostly immaculate dorsally, the paraventral pattern extends onto venter, and ventral is dark brown with center of venter mostly immaculate or with a narrow longitudinal line (Peters 1960; Harvey and Embert 2008). The identifying diagnostic characters and morphology (i.e., coloration and pattern, lepidosis, and meristic data) are congruent and agree with the descriptions by Schmidt and Walker (1943), Cunha and Nascimento (1978), Peters (1960), and Harvey and Embert (2008) for *D. indica indica* (Fig. 2, Table 1).

Discussion

The distribution of *Dipsas indica* appears to be wider than the other *Dipsas* species that occur in Bolivia (*D. bucephala*, *D. catesbyi*, *D. chaparensis*, *D. cisticeps*, *D. indica*, *D. pavonina*, *D. peruana*, *D. turgidus*, and *D. variegata*) and includes Brazil, Bolivia, Peru, Ecuador, Venezuela, Guyana, and Suriname (Fig 1; Peters 1960; Harvey and Embert 2008; Nogueira et al. 2019). How-

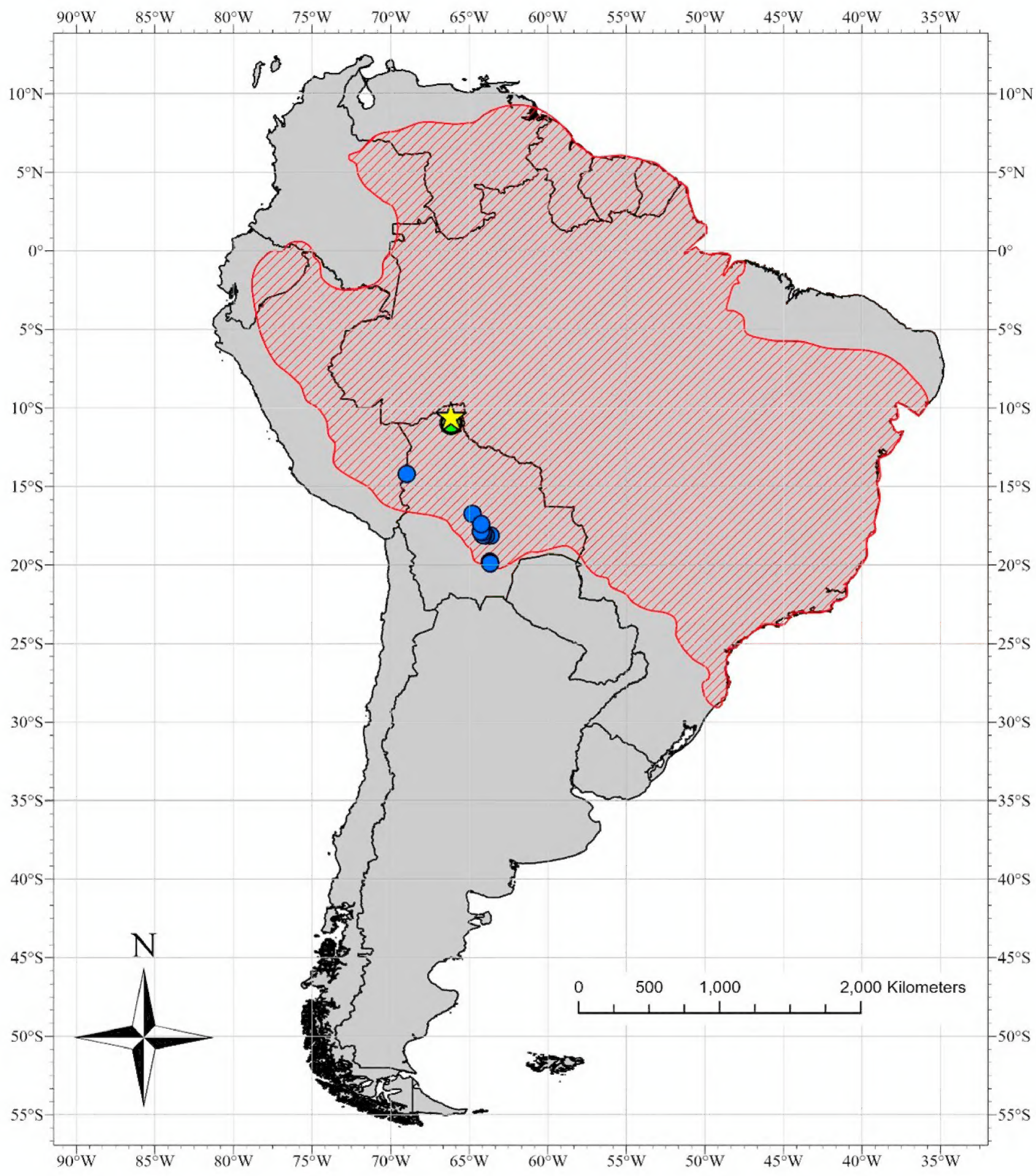

Figure 1. Locations of collected and vouchered *Dipsas indica* specimens from Bolivia in relation to the species' potential range in South America. Vouchered museum specimens from Bolivia include CIRA-909 (yellow star), CNK specimens (blue circles), and UMMZ Herps 59774 (green circle).

Table 1. Meristic data from *Dipsas indica* (CIRA-909) collected from Pando, Bolivia and specimen UMMZ 59774 listed by Harvey and Embert (2008).

Code	Dorsal scales	Ventral scales	Subcaudal scales	Cloacal	Supra-labials	Infra-labial	Loreal	Pre-ocular	Post-ocular	Temporal	Chin-shields
CIRA-909	13/13/11 (unkeeled, no apical pits)	210	126	Single/ entire	9	15	1	1	2	1+2	3 pairs
UMMZ Herps 59774		189	88	Single/ entire	9	13/13		1/1	2	2+2/1+2	3 pairs

ever, interestingly, it has not been as commonly collected and deposited into natural history collections as many of the other species in this genus. This may indicate that although widespread geographically, *D. indica* may not be locally abundant.

The combination of the new CIRA specimen and the additional *D. indica* specimens (CIRA, CNK, UMMZ; Table 2), represent an updated list and georeferenced

Figure 2. *Dipsas indica* (CIRA-909) collected in Bolivia, Department of Pando, Province General Federico Román. **A.** Living snake. **B.** Dorsal view. **C.** Ventral view.

report of this species from Bolivia. Specifically, in Bolivia, the distribution of *D. indica* occurs farther south than what has been previously described. Additionally, as stated by Harvey and Embert (2008), Boulenger (1896) likely collected a *D. indica* specimen from the province of Larecaja, Department of La Paz, which would represent the southwestern limit of this species in Bolivia. However, because of the unavailability of this specimen, this remains unclear. The apparently broad distribution across Bolivia and South America suggests that *D. indica* likely utilizes a broad array of habitat types and is likely a habitat generalist at the landscape scale. Nogueira et al. (2019) estimated a similar range of *D. indica* across South America; however, the specimen localities presented in their report are unreferenced and do not include voucher information. Therefore, the information reported by Nogueira et al. (2019) is limited in its overall utility for understanding the true range and distribution of this species. However, overall, this demonstrates the dearth of knowledge of this species across its range in South America.

Our report not only adds to the limited knowledge of this species' distribution in Bolivia, but also supports the assertion by Harvey and Embert (2008) that where this species occurs it may be parapatric with other species of *Dipsas*. However, it is important to note that more specimens are needed to fully delimit and understand the distribution of *D. indica* in Bolivia and throughout its range in South America. This will aid in a better understanding of the occurrence and occupancy of this species in the neotropics, which is limited throughout the entirety of its range (Harvey and Embert 2008). Additionally, although this species' conservation status is currently categorized as Least Concern (IUCN 2022), improved delineations of the true distributional range of *D. indica* will aid in future assessments of its conservation status.

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Table 2. Voucher specimens of *Dipsas indica* collected from Bolivia based on literature and published museum data (including new record).

Specimen	Date collected	Department	Province	Locality	Elevation (m)	Latitude	Longitude	Verifiable
UMMZ Herps 59774	Unknown	Pando	Madre de Dios	Madre de Dios River Junction with Rio Sena	150	–10.967	–066.150	Yes
CIRA-909	06-2022	Pando	General Federico Román	1km west of Comunidad Santa Teresa	502	–10.5552	–066.1524	Yes
CNK-23380	Unknown	Santa Cruz	Cordillera	Estancia Caraparicito, Pozo X 27	1470	–19.8379	–063.6968	No
CNK-23379	Unknown	Santa Cruz	Cordillera	Estancia Caraparicito, Yaguapoa	1177	–19.7833	–063.7000	No
CNK-23381	Unknown	Santa Cruz	Cordillera	Pozo X1 - Cima	1504	–19.8384	–063.7019	No
CNK-23382	Unknown	Santa Cruz	Cordillera	Yaguapoa	1009	–19.8946	–063.657	No
CNK-23387	Unknown	Santa Cruz	Florida	Bermejo	909	–18.1300	–063.6337	No
CNK-23388	Unknown	Santa Cruz	Florida	La Hoyada	1796	–17.9249	–064.1218	No
CNK-23389	Unknown	Santa Cruz	Florida	La Hoyada	1796	–17.9249	–064.1218	No
CNK-23390	Unknown	Santa Cruz	Florida	La Hoyada	1796	–17.9249	–064.1218	No
CNK-23394	Unknown	Santa Cruz	Florida	La Hoyada	1796	–17.9249	–064.1218	No
CNK-23353	Unknown	Santa Cruz	Florida	Mairana	1318	–18.1246	–063.9575	No
CNK-23355	Unknown	Santa Cruz	Florida	Palmasola, Yunga del Tontal	1525	–17.8923	–064.2095	No
CNK-23352	Unknown	Santa Cruz	Florida	Pampa Grande	1345	–18.1	–064.1	No
CNK-23383	Unknown	Santa Cruz	Florida	Pampagrande	1345	–18.1	–064.1	No
CNK-23395	Unknown	Santa Cruz	Florida	Pampagrande	1345	–18.1	–064.1	No
CNK-23396	Unknown	Santa Cruz	Florida	Pampagrande	1293	–18.0894	–064.1117	No
CNK-23397	Unknown	Santa Cruz	Florida	Pampagrande	1293	–18.0894	–064.1117	No
CNK-23398	Unknown	Santa Cruz	Florida	Pampagrande	1293	–18.0894	–064.1117	No
CNK-23385	Unknown	Santa Cruz	Florida	Pampagrande, Agua Clara	1342	–17.9992	–064.0952	No
CNK-23384	Unknown	Santa Cruz	Florida	Pampagrande, Barrio Nuevo	1406	–18.0132	–064.1113	No
CNK-23354	Unknown	Santa Cruz	Florida	Pampagrande, Becerro	1277	–18.0933	–064.1166	No
CNK-23386	Unknown	Santa Cruz	Florida	Pampagrande, La Hoyada	1796	–17.9249	–064.1218	No
CNK-23391	Unknown	Santa Cruz	Florida	Santa Rosa de Lima	1567	–17.8670	–064.2473	No
CNK-23392	Unknown	Santa Cruz	Florida	Santa Rosa de Lima	1567	–17.8670	–064.2473	No
CNK-23393	Unknown	Santa Cruz	Florida	Santa Rosa de Lima	1567	–17.8670	–064.2473	No
CNK-23400	Unknown	Santa Cruz	Ichilo	area de Inmovilizacion Cicatrices de Meandros antiguos del Rio Ichilo	202	–16.7459	–064.7833	No
CNK-23401	Unknown	Santa Cruz	Ichilo	Area de Inmovilizacion Cicatrices de Meandros antiguos del Rio Ichilo	202	–16.7459	–064.7833	No
CNK-23399	Unknown	Santa Cruz	Ichilo	Campamento Ichilo	319	–17.4000	–064.2333	No
CNK-56584	Unknown	Santa Cruz	Cordillera	Estancia Caraparicito, Pozo X 27	1926	–14.2039	–068.9697	No

torate of Biodiversity and Protected Areas for collection permit no. 0120/2022 and the Centro de Investigación de Recursos Acuáticos (CIRA). Universidad Autónoma del Beni "José Ballivian" for logistical support.

Author Contributions

Conceptualization: CBE, RLP, LRR. Data curation: CBE, RLP, LRR. Formal analysis: CBE. Funding acquisition: CBE. Visualization: CBE, RLP, LRR. Writing – original draft: CBE. Writing – review and editing: CBE, RLP, LRR.

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